BROOKINGS-LSE
Project on Internal Displacement

Climate Change and Displacement for Indigenous Communities in Arctic Scandinavia

January 30, 2013

Ilan Kelman
Marius Warg Næss
Center for International Climate and Environmental Research—Oslo

Cover image: Winifried K. Dallmann, Norwegian Polar Institute.
http://www.arctic-council.org/index.php/en/about/maps.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This paper explores anthropogenic climate change influencing displacement/migration for the Saami in Finland, Norway and Sweden near or above the Arctic Circle. Norway plays a large role throughout this discussion because (i) most residents in Arctic Scandinavia live in Norway, (ii) most indigenous peoples in Arctic Scandinavia live in Norway, and (iii) Norway is the only country of the three which has Arctic coastline.

The Saami have inhabited Scandinavia since the first human arrivals in the region as the glaciers retreated from the last ice age. Today, the Saami number approximately 50,000-100,000, although no formal censuses based on ethnicity exist. This means that defining who is Saami for statistical purposes is not always straightforward and often refers to those either speaking or having ancestors who spoke the Saami language.

Approximately 50-60 percent of the Saami live in Norway, 30-40 percent in Sweden, 10 percent in Finland, and under 4 percent in Russia. While the Saami inhabit almost all of Arctic Scandinavia, they are not exclusively an Arctic people, with their ranges extending as far south as approximately 62°N along the Norway-Sweden border. As rough estimates, approximately 900,000 people inhabit Arctic Scandinavia of whom perhaps 50,000-90,000 are Saami.

Saami are frequently associated with reindeer husbandry as a livelihood, but currently only around 10 percent of Saami are currently actively involved in it (Josefsen, 2010). Migration has long been a way of life in Arctic Scandinavia and the Saami reindeer herders have been nomadic or semi-nomadic for centuries. Mobility is central to the nomadic reindeer herding practiced by many Saami, but artificial boundaries such as private property, roads, and railways can inhibit the needs and routes of traditional mobility. It should also be noted that non-Saami migrated into the region over millennia and indigenous and non-indigenous peoples from around the world continue to migrate into the region.

In Norway, national policy (Government of Norway, 2009b) further supports people living throughout the country by providing financial incentives and supporting public services. For example, during the 1970s, most of the reindeer herders had moved into modern houses in central areas in the northernmost county of Finnmark due to official policies. The policy requiring nine years of schooling for children also made it impossible for whole families to live close to their herds year-round (Riseth and Vatn, 2009). Government policies made it possible for reindeer herders to attain a so-called “modern” standard of living in Norway (Nilsen and Mosli, 1994; Riseth and Vatn, 2009) which consequently changed their migratory lifestyle.

As largely rural areas, Arctic Scandinavia in all three countries experiences significant levels of outmigration. In particular young people often leave the region in search of education, larger settlements, or more varied livelihoods. Migration is often initially seen as temporary (for example, for university or independent travel) but may become long-term or permanent.

In fact, migration in Arctic Scandinavia displays all forms found in the mobility literature, including: in-migration, out-migration, and circular migration; and both temporary and permanent migration. Migration within the region also occurs, with people from one Arctic Scandinavian settlement easily moving to another for family or livelihood reasons, irrespective of national boundaries, facilitated by the fact that Scandinavians are permitted to live and work in other Scandinavian countries.

Climate Change in Arctic Scandinavia

The impact of climate change is expected to occur both sooner and more intensely in high latitudes than in other locations (ACIA, 2005; IPCC, 2007; Tebaldi et al., 2006). After surveying the many changes expected in the region, AMAP (2011, pp. 9-12) concludes that "everyone who lives, works or does business in the Arctic will need to adapt to changes in the cryosphere. Adaptation also requires leadership from governments and international bodies, and increased investment in infrastructure… There remains a great deal of uncertainty about how fast the Arctic cryosphere will change in the future and what the ultimate impacts of the changes will be."

Precipitation rates across Scandinavia, particularly in the form of rain, are expected to increase overall (Engen-Skaugen et al., 2008; Hanssen-Bauer, 2009). That increases the likelihood of floods while decreasing the likelihood of forest fires (Flannigan et al., 1998). Landslides and rockfalls are likely to increase in frequency for the first few decades due to increased ground instability from saturation. Climate change is expected to have particular effects in coastal locations as a result of decreasing sea ice, melting permafrost, and more unpredictability in weather. In addition to sea-level rise, storms will impact Arctic coastal areas. Along Norway's North Sea coast, climate change is expected to lead to noticeable increases in wind speed, wave height, and storminess.

Effects of Climate Change on Migration

Environmental Influences

During summer, reindeer subsist mostly on herbs and grasses which are found most commonly in mountain areas as are spring and fall pastures (Riseth and Vatn, 2009). With climate change projected to increase precipitation across Arctic Scandinavia, biological productivity might increase in spring, fall, and summer, but that productivity could be tempered by increased ground saturation and higher humidity, suggesting the possibility for more mold, fungus, and invasive species that thrive in a warmer climate.

The most important diet for reindeer during the winter is ground lichens which are commonly found in relatively dry continental areas (Riseth and Vatn, 2009). The rapidly shifting warm and cold periods during the winter resulting from climate change, coupled with a year-round increase in precipitation intensity, is projected to result in increased frequency of wet weather, deep snow, and ice crust formation with negative consequences for reindeer grazing during the winter (e.g. Solberg et al., 2001). The capacity of winter grazing areas tends to determine the maximum possible reindeer herd size which suggests that climate change affecting winter temperatures could be a factor in reducing maximum viable herd numbers. The environmental changes affect reindeer predators too. In Norway, reindeer herders receive compensation for reindeer lost to predators considered to be threatened (Government of Norway, 2001). The impacts of climate change on predators could be multi-faceted.

However, the impact of all of these factors on migration is likely to be limited simply because non-climate factors are much more important in influencing decisions about investments in reindeer herding. Attempting to assess the impact of climate change on this complex relationship between reindeer herding, predators, and predation compensation is difficult. Aside from reindeer herding, environmental changes occurring on the coast will impact Saami livelihoods. Climate change is projected to increase fish stocks in the Barents Sea while changing species composition and likely making more northern waters suitable for fish farming (Stenevik and Sundby, 2007).

Social Influences

Social structures in Arctic Scandinavia will be affected by climate change, consequently impacting migration decisions. Indigenous activities such as farming, fishing, and reindeer herding have a strong basis of traditional knowledge, including environmental variabilities and trends, since seasons and decadal cycles vary immensely in the Arctic. As the Arctic climate shifts into a new regime – a regime which has not been experienced since human habitation – the relevance of traditional knowledge for future operational decision-making is likely to decrease. Consequently, traditional knowledge becomes less of an anchor for the Saami to their Arctic environments and to their traditional livelihoods.

Social influences inhibit the prospects for reindeer-herding communities to use mobility as a response to environmental change. In all three Scandinavian countries, the trend has been towards privatizing land, putting up fences or other barriers, and redistributing and fragmenting pastures. As a consequence, while environmental variability is predicted to increase with climate change, the herders' ability to respond is reduced.

Mining exploration promoted by the national governments – for minerals such as gold, copper, and diamonds – has long been a source of conflict with Saami interests and has detrimentally impacted mobility as an adaptation strategy by taking away grazing land and interfering in migration routes (Korsmo, 1996). Forestry is another major area of conflict over land use while offshore oil exploration and extraction is a major initiative in Norway.

The final social influence discussed here is the increased infrastructure maintenance expected in Arctic Scandinavia due to climate change. As permafrost melts and the ground experiences less freezing, infrastructure may require retrofitting. With coastal wave energy expected to increase, coastal infrastructure will be subject to a long-term rise in the battering experienced from the sea, leading to damage from the physical force of waves, coastal erosion, and salt (Haugen and Mattson, 2011).

While the indigenous connection to their environment is being undermined by climate change, this will be one factor among many in their migration decisions – and in the migration decisions of others potentially moving to Arctic Scandinavia to pursue livelihoods.

Livelihoods Impacts

Analysis of the environmental and social influences of climate change on Saami migration in Arctic Scandinavia suggests that climate change itself will have limited impact on migration and is not likely to directly cause displacement. Instead, social and governance structures are influencing livelihoods in such a way that adaptation options are becoming more limited.

The main impact of climate change on migration and Saami livelihoods is not so much migration out from the Arctic, i.e. abandoning traditional livelihoods because of climate change, but migration into the Arctic from non-Saami who are seeking to pursue livelihoods in the Arctic. In particular, the increased emphasis on resource extraction will bring major changes to Arctic Scandinavia.

Indigenous Communities

The reactions of Saami to the potential effects of climate change on livelihoods and migration have taken different forms. There has been a perceived need for strong, almost militant, advocacy because of the history of the three central governments in ignoring indigenous interests, pursuing assimilation programs and forced displacement, and avoiding acknowledgement of indigenous

rights. The Saami have sought to work with other indigenous groups on promoting their rights and interests in the context of climate change. Another program, Many Strong Voices (MSV) "brings together the peoples of the Arctic and Small Island Developing States to meet the challenges of climate change." MSV is based on the premise that climate change challenges fundamental human rights and should be addressed on that basis.

It should be noted that indigenous views are far from homogenous. The Saami have many disagreements within and among groups, especially over managing change. The reindeer herders have been some of the most proactive Saami in terms of developing and implementing climate change adaptation activities

Indigenous Communities and Governments

The interaction between Saami and governments for reindeer herding is explored through analysis of some of the principle laws and regulations on reindeer husbandry. Even with climate change as a background over the past few decades, reindeer husbandry in Arctic Scandinavia has experienced far greater changes resulting from management decisions, which are not necessarily negative, but which must be acknowledged within the context of migration decisions (Beach, 2000; Berg, 2008; Bergstrøm, 2005; Bjørklund, 1999, 2004; Paine, 1994; Riseth, 2000; Riseth and Vatn, 2009).

The Saami have made it clear they are deeply concerned about the governmental approaches to managing Arctic Scandinavia under climate change. In 2008, the Saami Parliamentary Council's President stated at the UN Permanent Forum on Indigenous Issues that "neither our governments nor the industrial interests seeking exploration of the non-renewable resources on our territories have recognised our right to take part in the governing of and the right to share in the economic benefits of industrial recourses found in our territories" (Olli, 2008).

The issue is not just about resource extraction with or without Saami consent, but also the perception of full and fair consultation so that not only is due process followed, but also that Saami accept that due process has been followed. Similarly, perceptions that resource income is being applied for Saami benefit, and that decisions about resource income are being done in a consultative fashion, are part of ensuring that Arctic Scandinavia gains from the resource extraction expected to increase as a result of climate change.

Recommendations

There are a number of areas where future research is needed, including the impact of subsidies and compensation in Norway on livelihoods and migration decisions. Although much of the discussion here and in the literature focuses on reindeer herding, there are major gaps in understanding the migration-related decisions of non-reindeer herding Saami. Unlike reindeer herders where seasonal migration is a way of life, seasonal migration has not been extensively used by those pursuing other livelihoods. More work is needed to understand their perspectives on mobility – within and outside of the Arctic.

What actions are needed by communities, governments and other bodies?

Fundamentally, displacement due to climate change is not an inevitable outcome for Arctic Scandinavia. Instead, it is feasible to continue living in the Scandinavian Arctic without major problems, as long as the social support structures and governance regimes recognize the challenge of a changing Arctic and the difficulties that the Saami face. Nonetheless, climate change, the social support structures, and the governance regimes will influence people's decisions with respect to mobility and livelihoods, i.e. migration.

As such, the recommendations here are principally about making Arctic living viable in Scandinavia irrespective of climate change, especially for the Saami. The Saami face many threats and challenges to their livelihoods, but not principally from climate change, even though climate change may be an impetus or trigger for migration decisions.

The report concludes with a series of recommendations divided into categories according to the level of governance which would dominate the implementation: mainly (but not exclusively) local, non-local (mainly national), and joint local and non-local:

1. Mainly (not exclusively) local:
    - Education in Arctic schools (and elsewhere around Scandinavia) could include more content on indigenous traditions.
    - Mechanisms for conflict resolution could be improved, especially in terms of addressing conflicts between traditional and new livelihoods.
    - Local mapping of needs and actions for local climate change adaptation could be carried out in a way that includes both indigenous and non-indigenous perspectives.

2. Mainly (not exclusively) non-local, referring mainly to the national level:
    - Land use decisions require significant management and consultation processes.
    - More comparative analysis is needed to understand how the Saami reindeer herders can best adapt to climate change, especially through comparisons with pastoralists in other parts of the world. Comparative analysis is also needed to look more deeply into similarities and differences among Norway, Sweden, and Finland as well as the situation of the Russian Saami.
    - Arctic infrastructure and social mechanisms (e.g. financial incentives) could be further developed according to the needs of the residents (rather than outside interests) to permit living in the Arctic under climate change while pursuing locally-based livelihoods using traditions together with modern social and technological innovations.
    - Existing mechanisms could be used more effectively to address indigenous interests, such as the Arctic Council, the Nordic Council of Ministers, the European Union, and Barents Sea networks.

3. Joint local and non-local:
    - Improved coordination among all reindeer-related authorities and management mechanisms.
    - Coordination and linking of observational networks around the Arctic could be improved, especially to make better use of Saami knowledge.
    - Cooperation with Russia could be improved, as well as for other Arctic countries in order to strengthen links between the Saami and other indigenous peoples' networks.

Conclusions

Change is needed in three overarching directions. First, short-term action with long-term perspectives is needed now. Climate change is occurring, and will continue to occur faster in the Arctic than in other regions. Secondly, full and fair participation of Saami in decisions affecting them should be ensured. Third, the changing demographics of Arctic Scandinavia need to be recognized and addressed, especially with regards to temporary migrants.

By supporting change in these three overarching directions, the impact of climate change on indigenous people in Arctic Scandinavia can be lessened and its impact on migration minimized. Climate change is already occurring and is unlikely to be reversed. The Arctic and the peoples

living there will need to deal with its effects. That does not mean abandoning their traditions, livelihoods, or homes. Instead, it means working collaboratively to ensure that indigenous interests are respected and that indigenous needs are met without precluding the involvement of others in the Arctic and without being overwhelmed by climate change.

1. BACKGROUND

1.1. Terminology

Before beginning this analysis into climate change and displacement for indigenous communities in Arctic Scandinavia," several terms require clarification.

Two geographic terms to explain are "Scandinavia" and "Arctic." "Scandinavia" here refers to the common usage as the countries Finland, Norway, and Sweden. That includes Norway's archipelago of Svalbard (with its main island of Spitsbergen) in the High Arctic and governed by a treaty which gives several other countries resource access rights (Svalbard Treaty, 1920). Defining "Arctic" tends to be less straightforward, with some considering it to be areas north of the treeline and others including the entirety of countries with northern territories. Here, the Arctic will be considered to be areas near or above the Arctic Circle, which is the circle at approximately 66.6°N.

The UN Secretariat of the Permanent Forum on Indigenous Issues (UN, 2004: p. 2) gives a 268-word definition for "what and who is indigenous." Characteristics include "having a[n] historical continuity with pre-invasion and pre-colonial societies that developed on their territories" and "consider[ing] themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them." In most cases, indigenousness or non-indigenousness is fairly clear, but there are ambiguities. For Arctic countries, no indigenous peoples existed on Iceland or the Faroes prior to settlement, so Icelanders and Faroese today could potentially be considered to be indigenous, yet they are rarely considered so. For Arctic Scandinavia, such ambiguities do not arise because the only people indigenous to the region who are still living in the region are the Saami,[1] who also live in western Arctic Russia.

In the context of people's mobility, "displacement" can be understood as the noun of the usual English dictionary definition of "to displace", i.e. "to compel to leave." In international law, migration is generally assumed to be voluntary movement while displacement implies coercion (UN, 1998) The reality is that such a dichotomy is rarely seen, with a continuum being the norm. As will be shown, for Scandinavia for this paper, "to migrate" meaning "to shift location" is more relevant than "to displace" in the context of climate change. As such, this paper will tend to use "migration" rather than "displacement," but sometimes the two terms are used interchangeably.

"Climate change" has two different principal definitions. The Intergovernmental Panel on Climate Change (IPCC), a UN-affiliated group for synthesising the science on climate change, defines the term to be "any change in climate over time, whether due to natural variability or as a result of human activity" (IPCC, 2007: 871). The United Nations Framework Convention on Climate Change, the principal treaty on climate change, defines the term to be "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UN, 1992: Article 1, Paragraph 2). That is, the scientific view takes climate change to be all climate trends irrespective of the origin of those trends while the principal legal instruments and current public debate focus on anthropogenic climate change. Migration decisions linked to climate will be made irrespective of why the climate is changing, but this paper focuses on anthropogenic climate change.

[1] Also spelled "Sami" and "Sámi" with no difference in meaning among the different spellings. Saami are no longer referred to as "Lapps" or "Laplanders." as those terms are usually considered to be derogatory for the Saami (although in English, "Laplander" can refer to people inhabiting the northern Swedish province/region of Lapland and the northern Finnish region/province also called Lapland.) "Sápmi" is the area which the Saami inhabit.

With this clarification in terminology, this paper will explore anthropogenic climate change influencing displacement/migration for the Saami in Finland, Norway, and Sweden near or above the Arctic Circle. This means that Svalbard in Norway's High Arctic which has never had indigenous peoples will not be considered here, even though the archipelago and its polar bears have become an icon for climate change impacts.

1.2. Indigenous Peoples in Arctic Scandinavia

The Saami have inhabited Scandinavia since humans first arrived in the region with the retreat of glaciers from the last ice age. Written descriptions of the Saami by outsiders date back to at least the Roman Empire when the sole inhabitants of Arctic Scandinavia were indigenous peoples. Today, the Saami number approximately 50,000-100,000, although no formal censuses based on ethnicity exist. This means that defining who is Saami for statistical purposes is not always straightforward and often refers to those either speaking or having ancestors who spoke the Saami language. Adding to the confusion, Norway collects geographically delineated statistics pertaining to a 'Saami area.' This geographic area is designated as the area covered by the Saami Parliament subsidy schemes for business development, yet the statistics do not differentiate between Saami and non-Saami, or between Arctic and non-Arctic people, in the area.[2]

Approximately 50-60 percent of the Saami live in Norway, 30-40 percent in Sweden, 10 percent in Finland, and under 4 percent in Russia. While the Saami inhabit almost all of Arctic Scandinavia, they are not exclusively an Arctic people, with their ranges extending as far south as approximately 62°N along the Norway-Sweden border. As rough estimates, approximately 900,000 people inhabit Arctic Scandinavia of whom perhaps 50,000-90,000 are Saami.

Saami are frequently associated with reindeer husbandry as a livelihood, but only approximately 10 percent of Saami are currently actively involved in it (Josefsen, 2010). The reindeer herders have been nomadic, relying on their herds for food (meat and dairy), fur, and transport and for supplying those products to others in the region. Although it is difficult to pinpoint accurately the origin of reindeer husbandry as a pastoral livelihood, it developed at least 400 years ago (e.g. Riseth and Vatn, 2009) and probably evolved from a hunting culture based on wild reindeer. All modern technology has been adopted in reindeer husbandry, from snowmobiles in the mid-1960s to mobile phones today. That leads to a blend of livelihoods, with traditional reindeer herding still being followed by Saami who might also be studying for a PhD or have another town-based livelihood. A phenomenon which is increasing is that the reindeer herders are less likely to live with the herds as much as they did in earlier time, but rather go on day trips to see and feed the reindeer.

Other traditional livelihoods for the Saami include fishing and farming. The 'Sea Saami' are indigenous groups living on or near the coast who have been heavily dependent on fishing and sealing, as well as livestock rearing and trapping. Naturally, all Saami groups interacted and traded with each other and with non-Saami, further supplementing livelihoods.

Today, the Saami University College in Guovdageaidnu/Kautokeino, Norway and the Saami Education Centre in Jokkmokk, Sweden help to educate Saami and non-Saami about Saami traditions and livelihoods to keep them as central parts of lifestyles in the region. Tourism-based livelihoods—with tourists coming to learn about the Saami and see the Saami way of life, especially reindeer herding—are becoming increasingly popular. For instance, the World Heritage site of Laponia in Sweden is a major tourist attraction, in addition to still being used for reindeer herding. Norway has major tourist attractions in the Arctic as well, including the Lofoten archipelago and

[2] See http://www.ssb.no/english/subjects/02/01/10/samisk_en noting their own words "Because there is no overall registration of the Sami population, no one knows exactly how many Sami there are today."

North Cape, marketed as being the northernmost mainland point in Europe, but the scenic tourist routes are not always linked to indigenous heritage or contemporary livelihoods.

The relationship between tourism and traditional Saami livelihoods is complex. Tourism generates some Saami livelihoods and gives tourists the 'Saami experience' (sometimes respectful, but sometimes quaint and patronising.) However, balancing natural heritage-based tourism with traditional Saami livelihoods might not always be possible. Due to the overall dearth of statistics on the numbers of Saami, data is scarce on the extent to which tourism generates income or livelihoods by Saami and whether such income relates to Saami culture or not. In fact, there is no overall registration of Saami livelihoods—apart from reindeer herding, since that is defined as an exclusively Saami livelihood in Norway and Sweden.

Saami are a minority in most Scandinavian Arctic communities (and in non-Arctic communities where they live), with Unjárga/Nesseby in Norway which has a Saami majority being an exception. In fact, few areas in the Scandinavian Arctic are purely indigenous or non-indigenous. Saami and non-Saami live in the same communities and Saami/non-Saami marriages are frequent. Due to the expected major influence of climate change on reindeer herding, in addition to the existing challenges associated with nomadism in affluent countries dominated by non-nomadic livelihoods, reindeer herding dominates much of the discussion in this paper. That does not diminish the migration influences on non-reindeer herding Saami which are described as well.

1.3. Migration and Displacement in Arctic Scandinavia

Migration has long been a way of life in Arctic Scandinavia and the Saami reindeer herders have been nomadic or semi-nomadic for centuries. Non-Saami migrated into the region over millennia and indigenous and non-indigenous peoples from around the world continue to migrate into the region. For instance, Harstad, Norway has an office for the petroleum company StatOil employing 280-300 staff, many of whom are not originally from the region. Jokkmokk, Sweden holds a famous region-wide winter festival and conference every year, drawing in people from the region as well as tourists, thereby generating livelihoods. Norway settles many refugees and asylum seekers above the Arctic Circle as part of a dispersal policy to support underpopulated regions and to avoid the ghettoization of refugees and asylum-seekers in larger centres in the south of the country.

In Norway, aside from the refugees and asylum seekers, national policy (Government of Norway, 2009b) further supports people living throughout the country by providing financial incentives and supporting public services. For example, during the 1970s, most of the reindeer herders had moved into modern houses in central areas in the northernmost county of Finnmark due to official policies such as the 1958 and 1969 housing programmes that made modern houses affordable for herders. The policy of nine years of compulsory schooling for children also made it impossible for whole families to live close to their herd year-round (Riseth and Vatn, 2009). These policies made it possible for reindeer herders to attain a so-called "modern" standard of living in Norway (Nilsen and Mosli, 1994; Riseth and Vatn, 2009) which consequently changed their migratory lifestyle.

As largely rural areas, Arctic Scandinavia in all three countries experiences significant levels of outmigration. In particular young people often leave the region in search of education, larger settlements, or more varied livelihoods. Migration is often initially seen, as temporary, (for example, for university or independent travel) but may become longer-term or permanent because the migrants prefer other locations or because their partners or families do not wish to live in the Arctic.

Migration in Arctic Scandinavia displays all forms found in the mobility literature, including:

- In-migration, out-migration, and circular migration.

- Temporary and permanent migration (either of which could be in-migration or out-migration).

Migration within the region also occurs, with people from one Arctic Scandinavian settlement easily moving to another for family or livelihood reasons, irrespective of national boundaries, facilitated by the fact that Scandinavians are permitted to live and work in other Scandinavian countries.

Mobility is central to the nomadic reindeer herding practiced by many Saami, but artificial boundaries such as private property, roads, and railways can inhibit the needs and routes of traditional mobility. Nonetheless, in 2009, Norway and Sweden signed a new cross-border grazing agreement covering 24 grazing areas that Swedish herders can use in Norway and 16 grazing areas that Norwegian herders can use in Sweden, as well as recognizing two common areas on both sides of the border (Governments of Norway and Sweden, 2009ab). In 2010, Swedish herds comprising 42,000 reindeer had grazing rights in Troms County, Norway while Swedish herds comprising 77,538 reindeer had grazing rights in Nordland and Nord-Trøndelag Counties. Monitoring how often those rights are exercised is not feasible although Swedish herds normally graze on the Norwegian side during summer, while Norwegian herds normally graze on the Swedish side during winter. Finland has closed its borders to reindeer herds, with the Norway-Finland border marked by fences to prevent cross-border grazing (Tømmervik & Riseth 2011) while on the Finland-Sweden border rivers and lakes form a clear boundary between grazing areas.[3]

1.4. Climate Change in Arctic Scandinavia

The impact of climate change is expected to occur both sooner and more intensely in high latitudes than in other locations (ACIA, 2005; IPCC, 2007; Tebaldi et al., 2006). Hanssen-Bauer et al. (2005) reviews several studies indicating that Scandinavia's climate change is projected to be characterised by:

1. Increased warming rates as distance from the coast increases.
2. Higher warming rates in winter compared to summer.
3. Increased precipitation, especially during winter. Due to rising temperatures, snowfall might decrease in some locations even if winter precipitation increases.

AMAP (2011, pp. 4-7) provides the most recent comprehensive summary of climate change impacts around the Arctic, with the following specific findings:

- "The past six years (2005-2010) have been the warmest period ever recorded in the Arctic. Higher surface air temperatures are driving changes in the cryosphere.[4]
- There is evidence that two components of the Arctic cryosphere – snow and sea ice – are interacting with the climate system to accelerate warming.
- The extent and duration of snow cover and sea ice have decreased across the Arctic. Temperatures in the permafrost have risen by up to 2°C. The southern limit of permafrost has moved northward in Russia and Canada.
- The largest and most permanent bodies of ice in the Arctic – multiyear sea ice, mountain glaciers, ice caps and the Greenland Ice Sheet – have all been declining faster since 2000 than they did in the previous decade.

[3] Reindeer can swim, and many have calving areas on lake islands, but moving the herds across the border is not permitted.

[4] The cryosphere refers "collectively to the portions of the Earth where water is in solid form. It includes snow cover, floating ice, glaciers, ice caps, ice sheets, seasonally frozen ground and perennially frozen ground (permafrost)". (National Snow and Ice Data Center 2013)

- Model projections reported by the Intergovernmental Panel on Climate Change (IPCC) in 2007 underestimated the rates of change now observed in sea ice.
- Maximum snow depth is expected to increase over many areas by 2050, with greatest increases over Siberia. Despite this, average snow cover duration is projected to decline by up to 20% by 2050.
- The Arctic Ocean is projected to become nearly ice-free in summer within this century, likely within the next thirty to forty years."

AMAP (2011, pp. 9-12) also provides the most recent comprehensive summary of consequences for people for these climate change impacts:

- "Changes in the cryosphere cause fundamental changes to the characteristics of Arctic ecosystems and in some cases loss of entire habitats. This has consequences for people who receive benefits from Arctic ecosystems.
- The observed and expected future changes to the Arctic cryosphere impact Arctic society on many levels. There are challenges, particularly for local communities and traditional ways of life. There are also new opportunities.
- Transport options and access to resources are radically changed by differences in the distribution and seasonal occurrence of snow, water, ice and permafrost in the Arctic. This affects both daily living and commercial activities.
- Arctic infrastructure faces increased risks of damage due to changes in the cryosphere, particularly the loss of permafrost and land-fast sea ice.
- Loss of ice and snow in the Arctic enhances climate warming by increasing absorption of the sun's energy at the surface of the planet. It could also dramatically increase emissions of carbon dioxide and methane and change large-scale ocean currents. The combined outcome of these effects is not yet known.
- [Melting] Arctic glaciers, ice caps and the Greenland Ice Sheet contributed over 40% of the global sea level rise of around 3 mm per year observed between 2003 and 2008. In the future, global sea level is projected to rise by 0.9–1.6m by 2100 and Arctic ice loss will make a substantial contribution to this.
- Everyone who lives, works or does business in the Arctic will need to adapt to changes in the cryosphere. Adaptation also requires leadership from governments and international bodies, and increased investment in infrastructure.
- There remains a great deal of uncertainty about how fast the Arctic cryosphere will change in the future and what the ultimate impacts of the changes will be. Interactions ('feedbacks') between elements of the cryosphere and climate system are particularly uncertain. Concerted monitoring and research is needed to reduce this uncertainty."

Precipitation rates across Scandinavia, particularly in the form of rain, are expected to increase overall (Engen-Skaugen et al., 2008; Hanssen-Bauer, 2009). That increases the likelihood of floods while decreasing the likelihood of forest fires (Flannigan et al., 1998). Landslides and rockfalls are likely to increase in frequency for the first few decades due to increased ground instability from saturation, but as material slides down, the frequency or magnitude of landslides and rockfalls could potentially decrease. The impact of climate change on avalanches is less certain as they depend on type of snow and the sequence of precipitation events and of freezing/thawing.

Regarding changes pertinent to coastal and marine locations, Norway is the only country affected as it is the only Scandinavian country with coastline above the Arctic Circle. Some of the key potential consequences for coastal areas and the sea, as well as some inland areas are: (ACIA, 2005; AHDR, 2004; AMAP, 2011; Førland et al., 2009; IPCC, 2007):

- Less sea ice will result in more powerful wave action and increased storminess, augmenting coastal erosion.

- Melting permafrost could lead to changing ground stability and changing vegetation.
- As the air temperature shifts above and below the freezing point (0°C), water freezes and thaws, damaging plants and infrastructure. Snow melting more frequently, and then perhaps freezing into ice, can mean less cover for vegetation, soggier ground, and increased prospects for fungus and mould in infrastructure.
- Changes to ecosystems will occur as plants and animals more suited to the new climate establish themselves.
- Temperature gradients and fluctuations might become less stable. Places directly on the Scandinavian Arctic coast already experience rapid air temperature changes all year around. Locations one-ten kilometres from the coast and across the coastal mountains tend to be drier and sunnier, sometimes several degrees warmer, than the coast. That difference is expected to remain, with inland areas experiencing greater temperature increases than coastal areas due to climate change.

Within Scandinavia, sea-level rise is somewhat balanced by what is known as post-ice age rebound (isostatic uplift) in which the weight of the ice age's glaciers pushed the land down so far that it is still rising as a result of the melting of the glaciers from the last ice age. For the next few decades, although not always afterwards, much of the Scandinavian coastline will continue to rise faster than sea-level rise—unless a catastrophic ice melting scenario occurs, such as the collapse of Antarctic or Greenland ice sheets generating a five metre or more rise in sea level. For example (data are from Drange et al., 2007), Bodø in the southern part of Norway's Arctic will experience a relative sea-level fall of 3-5 cm by 2050, but by 2100 sea-level rise will have overtaken isostatic uplift yielding a net sea-level rise of 5-18 cm. Tromsø, Norway is the Scandinavian Arctic's main city and is projected to see relative sea-level rise of 5-7 cm by 2050 and 23-36 cm by 2100. As such, even without the melting of large-scale ice sheets, some coastal infrastructure will need to be moved or retrofitted.

In addition to sea-level rise, storms will impact Arctic coastal areas. Along Norway's North Sea coast, climate change is expected to lead to noticeable increases in wind speed, wave height, and storminess (Debernard and Røed, 2008; Debernard et al., 2002), although the projections are uncertain and the seasonality of the changes is not well studied. Meanwhile, Norwegian Sea storms called 'polar lows' are expected to decrease in frequency due to climate change because the North Atlantic's ocean water is projected to warm more slowly than the air above it, leading to greater atmospheric stability which impedes polar low formation (Zahn and von Storch, 2010).

Oceans absorb carbon dioxide which combines with water to form carbonic acid, making the oceans more acidic as carbon dioxide increases in the atmosphere. Ocean acidification could affect marine ecosystems in the Arctic, but is expected to have less of a discernible impact than rising sea temperatures which are pushing marine species north. Salinity of Arctic waters is also expected to decrease as a result of climate change as melting ice injects more fresh water into the oceans.

One big unknown is the impact of climate change on the Gulf Stream. The Gulf Stream is a large ocean current starting in the Caribbean and moving northeast across the Atlantic. It becomes the North Atlantic Current, bringing warm water to the United Kingdom and Norway, resulting in a much milder climate than would otherwise be expected at these latitudes. With the global climate and ocean systems closely coupled, there has been speculation that climate change could weaken or disrupt the Gulf Stream, plunging northeastern Europe into a deep freeze. However, despite careful monitoring, no evidence exists that the Gulf Stream is changing despite other climate change-related changes being observed in the ocean.

A changing Gulf Stream, as with possible ice sheet collapses, is one of the possible extreme scenarios that would cause major displacement of indigenous and non-indigenous peoples across

Arctic Scandinavia due to climate change. As such scenarios are rife with uncertainty and do not appear to be imminent (see IPCC, 2007), they are not considered further in this paper.

2. EFFECTS OF CLIMATE CHANGE ON MIGRATION

In the sections below, three different types of influences are used to explore the way in which climate change influences Saami migration. The first section, "Environmental influences" discusses how the changing environment will directly impact migration. This is followed by a discussion of "Social influences" which analyzes the way in which climate change influences social structures which in turn impact migration. Thirdly, the "Livelihoods" section looks at the relationship between these environmental and social influences as they relate to livelihoods and migration.

2.1. Environmental Influences

During summer, reindeer subsist mostly on herbs and grasses which are found most commonly in mountain areas as are spring and fall pastures (Riseth and Vatn, 2009). With climate change projected to increase precipitation across Arctic Scandinavia, biological productivity might increase in spring, fall, and summer, but that productivity could be tempered by increased ground saturation and higher humidity, suggesting the possibility for more mold, fungus, and invasive species that thrive in a warmer climate. As detailed micro-scale studies are not available, exploration of the impact of climate change on reindeer summer food is speculative, particularly given the many interacting factors.

The most important diet for reindeer during the winter is ground lichens which are commonly found in relatively dry continental areas (Riseth and Vatn, 2009). The rapidly shifting warm and cold periods during the winter resulting from climate change, coupled with a year-round increase in precipitation intensity, is projected to result in increased frequency of wet weather, deep snow, and ice crust formation with negative consequences for reindeer grazing during the winter (e.g. Solberg et al., 2001). The capacity of winter grazing areas tends to determine the maximum possible reindeer herd size which suggests that climate change affecting winter temperatures could be a factor in reducing maximum viable herd numbers.

Rees et al. (2008) argue that climate change impacts are likely to inhibit reindeer husbandry livelihoods in Norway and Sweden, have a neutral impact in Finland, and have mildly positive impacts in Russia. The main factors for these impacts are the changing vegetation distribution due to the changing climate, notably winter temperature and winds. Nevertheless, they argue that the effect of these changes is expected to be relatively small and well within the range of previous experience of reindeer herders dealing with climate variability. Yet almost all climate models predict future winter climatic conditions to be more variable than today for most reindeer husbandry areas which suggests that adaptation measures would still be needed. The migration impacts are likely to be limited to small changes in migration patterns by the reindeer herders, simply because non-climate factors are much more important in influencing decisions about investments in reindeer herding.

The environmental changes affect reindeer predators too. In Norway, reindeer herders receive compensation[5] for reindeer lost to predators considered to be threatened (Government of Norway, 2001). These predators are lynx (*Lynx lynx*), wolverine (*Gulo gulo*), brown bear (*Ursus arctos*), wolf (*Canis lupus*), and golden eagle (*Aquila chryaetos*). Reindeer herders have reported that predators cause around 75 to 95 percent of total calf losses and around 60 to 85 percent of total

[5] In Norway, herders can receive compensation for (1) losses due to the five predators listed in the text; (2) extensive losses (e.g. avalanches or other catastrophes); (3) reindeer killed by trains; and (4) reindeer killed by road vehicles.

adult losses (Reindriftsforvaltningen, 2008). The stated rationale underlying predation compensation is: (1) to compensate loss and subsequent costs when reindeer are lost or injured by certain predators (as listed above); and (2) to reduce the loss of reindeer (Government of Norway, 2001; Anonymous, 2001). Protecting the predator species from harm by reindeer herders does not seem to be a rationale for the rule, although the rule includes only the five animals mentioned above as 'predators.' In addition, in order to qualify for compensation, reindeer herders must fulfill a list of conditions including having taken precautions to try to avoid loss from predators.

The impacts of climate change on predators could be multi-faceted. Both non-reindeer food for reindeer predators and predators' ranges could either increase or decrease. Weaker reindeer are more susceptible to predation, which could be a particular factor in the winter as the reindeer need to forage longer and harder. Yet human-predator conflicts appear to be increasing irrespective of climate change. In Norway, predation compensation almost doubled from 2004 to 2007, yet conversely in 2006-2007 only 30 percent of the reported predation loss was compensated (Næss et al., 2011). Many factors influence these data, such as changes in reindeer numbers over the reported time period, how the herders fill out the forms requesting compensation, and the number of documented kills compared to the number of claims for kills (Næss et al., 2011).

In Sweden, the government introduced a licensed wolf hunt for anyone in 2010 and 2011, but was then forced to withdraw it under pressure from domestic environmentalists and the European Commission. The wolf issue is as contentious in Finland, with those living in areas inhabited by wolves becoming increasingly irritated by the animals while those not living in wolf areas support conservation measures (Bisi and Kurki, 2008).

Predation has other complicating factors on reindeer husbandry livelihoods. Predation compensation has led to increased future herd sizes because money from compensation may make it possible for herders to reduce their own slaughtering to generate income while converting animals reported to have been killed by predators into cash that they can use to purchase livestock capital (see further discussion in Næss et al., 2011). As larger herd sizes maximize long-term viability for pastoral households (cf. Næss and Bårdsen, 2010), Næss et al. (2011) argued that predation compensation may represent an additional risk-reducing strategy in reindeer husbandry.
Yet predation compensation in Norway has significant shortcomings in that it is based on reporting by the herders with little verification to ensure that an animal stated as being killed by a predator was indeed killed by a predator (Schwerdtner and Gruber, 2007). Bulte and Rondeau (2005) have argued that predation compensation may alter the optimal number of livestock kept by pastoralists as without compensation, an important cost connected to increasing the number of livestock is increased predation probability.

Attempting to assess the impact of climate change on this complex relationship between reindeer herding, predators, and predation compensation is difficult. Given the complex relationship between the health and size of reindeer herds, predators and predation compensation, it is difficult to de-couple environmental factors from others influencing livelihoods decisions in the context of reindeer husbandry. Those livelihood decisions, in turn, affect migration, both in terms of migration for reindeer herding and migration when a decision is made to leave reindeer herding. As such, making links between climate change, reindeer predation, and migration decisions for reindeer herders has severe limitations.

Aside from reindeer herding, environmental changes occurring on the coast will impact Saami livelihoods. Climate change is projected to increase fish stocks in the Barents Sea while changing species composition and likely making more northern waters suitable for fish farming (Stenevik and Sundby, 2007). Depending on how the increased fish stocks are managed, fishing livelihoods could

draw people into the region for livelihoods and recreation; that is, in-migration related to fishing livelihoods could increase under climate change.

Inland freshwater ecosystems have also been identified as changing, likely due to climate change, with implications for livelihoods and migration. As one example, Sorvari et al. (2002) implicated climate change as affecting diatoms in lakes in northern Finland. Kullman (2001) identifies the tree line rising in altitude in Swedish mountains, again due to climate change. Melting permafrost will also be one of the biggest ecosystem changes across the Scandinavian Arctic. Even though it is clear that ecosystems are changing in many ways as a result of climate change, connecting such changes to migration is not straightforward. Ecosystem shifts are simply one influence among many on the decisions that people make regarding migration.

2.2. Social Influences

Social structures in Arctic Scandinavia will be affected by climate change, consequently impacting migration decisions. Indigenous activities such as farming, fishing, and reindeer herding have a strong basis of traditional knowledge. That knowledge includes environmental variabilities and trends, since seasons and decadal cycles vary immensely in the Arctic. As the Arctic climate shifts into a new regime – a regime which has not been experienced since human habitation -- the relevance of traditional knowledge for future operational decision-making is likely to decrease.

Consequently, traditional knowledge becomes less of an anchor for the Saami to their Arctic environments and to their traditional livelihoods although it remains relevant in supporting community structures and coherence. But many indigenous peoples remain in their communities because their knowledge helps them to pursue traditional livelihoods and to make sense of the environment around them as part of their identity. If the environment changes beyond the scope of their knowledge, there might be less incentive to stay in an unfamiliar environment.
This increasing disconnect between indigenous people's knowledge and environmental changes has been documented elsewhere around the Arctic (e.g. Gearheard et al., 2009) although there has been less work on this issue for the Saami.

For reindeer herders, mobility as a way of life has long been used to respond to climate variations. Little et al. (2001) argue that mobility is the main factor explaining why some pastoralists do relatively well during extreme climatic events, while others do not. While the importance of mobility as a tool for buffering environmental variation is well documented in other parts of the world, much less is known about how Saami reindeer herders in Norway use mobility strategically to manage environmental unpredictability – and how that could be used as a continuing strategy within the context of climate change.

Yet social influences inhibit the prospects for reindeer-herding communities to use mobility as a response to environmental change. In all three Scandinavian countries, the trend has been towards privatizing land, putting up fences or other barriers, and redistributing and fragmenting pastures. As a consequence, while environmental variability is predicted to increase with climate change, the herders' ability to respond is reduced.

Mining exploration promoted by the national governments – for minerals such as gold, copper, and diamonds – has long been a source of conflict with Saami interests and has detrimentally impacted mobility as an adaptation strategy by taking away grazing land and interfering in migration routes (Korsmo, 1996).

Forestry is another major area of conflict over land use. Carina and Keskitalo (2009) use a case study of Gällivare in northern Sweden, exploring how climate change is expected to exacerbate

conflicts over the use of the forests for logging, reindeer husbandry, and winter tourism. Mining again emerges as being a concern in this area, with Saami complaining that so many mining-related applications are being made that they cannot keep up with them. Moreover, all such conflicts require time, resources, and energy from the indigenous communities. Even when the resolution is satisfactory to the Saami, the conflict resolution process itself may be so draining and unsettling that Saami leave their land and pre-conflict livelihoods. The process may also affect the communities' perception of how they will be treated in the future regarding issues such as land rights, water rights (particularly for hydroelectricity), forestry, and mineral extraction.

Saami in Finland have experienced similar challenges to those in Sweden, with films poignantly demonstrating the challenges to Saami livelihoods. Gold mining in Lemmenjoki has damaged reindeer herder pastures as evidenced by a YouTube video[6] showing the resultant scars in the forest landscape. Meanwhile, the documentary film *The Last Yoik in Saami Forests?* details conflicts between foresters, namely the state enterprise Metsähallitus, and Saami reindeer herders. While migration from the south into Finland's Arctic has increased substantially in order to take advantage of logging livelihoods, the logging harms the lichen which the reindeer eat.

The final social influence discussed here is the increased infrastructure maintenance expected in Arctic Scandinavia due to climate change. As permafrost melts and the ground experiences less freezing, infrastructure built on the assumption of more stable ground may require retrofitting. With coastal wave energy expected to increase, not just as a result of storms but also due to less sea ice, coastal infrastructure will be subject to a long-term rise in the battering experienced from the sea, leading to damage from the physical force of waves, coastal erosion, and salt (Haugen and Mattson, 2011).

With higher overall air temperature, more transitions between freezing and non-freezing temperatures are expected, resulting in more freeze/thaw transitions. When water freezes to ice, its volume expands. Saturated ground that freezes and thaws experiences heave and subsidence alternately, undermining roads, railways, power lines, and other infrastructure. The more freeze/thaw transitions experienced, the more often the infrastructure must be repaired. The same situation is witnessed in masonry buildings where small amounts of rainwater or dew infiltrate the bricks, blocks, and mortar. When this is followed by freezing and expansion, cracks and flaking result. Haugen and Mattson (2011) further describe the chemical processes leading to increased salt crystallization in buildings due to climate change and the resultant damage. The infrastructure damage caused by freeze/thaw transitions is in addition to the increased expected damage from mould and fungus emerging from increased air humidity and ground saturation.

It is hard to determine whether or not the changes to infrastructure resulting from climate change will influence migration. Would the increased maintenance costs and damage be an impetus for the Saami to seek livelihoods elsewhere? Or would more opportunities for maintenance-related livelihoods draw people into the Scandinavian Arctic?

The overall lesson from all this section's discussion of the social influences of climate change is that the indigenous understanding and connection to their environment is being undermined by climate change, but that this will be one factor among many in their migration decisions – and in the migration decisions of others potentially moving to Arctic Scandinavia to pursue livelihoods.

[6] http://www.youtube.com/watch?v=NahOTuJA090

2.3. Synthesis: Livelihoods Impacts

This analysis of the environmental and social influences of climate change on Saami migration in Arctic Scandinavia suggests that climate change itself will have limited impact on migration and is not likely to directly cause displacement. Instead, social and governance structures are influencing livelihoods in such a way that adaptation options are becoming more limited.

The main impact of climate change on migration and Saami livelihoods is not so much migration out from the Arctic, i.e. abandoning traditional livelihoods because of climate change, but migration into the Arctic from non-Saami who are seeking to pursue livelihoods in the Arctic. In particular, the increased emphasis on resource extraction will bring major changes to Arctic Scandinavia. On the land, mining for minerals is the main draw, with significant exploration currently underway while exploitation of forest resources is also significant. Offshore, in the case of Norway, the focus is petroleum, i.e. oil and gas. Even where exploration and development occur far offshore, in or beyond the Exclusive Economic Zone, livelihoods on land are influenced due to the movement of offshore workers, the need for onshore processing, storage, and transportation facilities and the threat of spills.

The first oil and gas fields north of the Arctic Circle to be developed in Norway are near Hammerfest: the Snøhvit (Snow White) natural gas field which began production in 2007 and the Goliat oil and gas field which is expected to begin full production in mid-2014. The companies involved, in conjunction with the Norwegian government, state that they are factoring in local livelihoods and interests. For example, Statoil which operates Snøhvit, has stipulated requirements that contractors and suppliers and their sub-contractors should develop a local presence and acquire goods and services from local suppliers. Furthermore, Statoil along with other oil companies has supported local supply company development through financial support to organisations such as Pro Barents (http://www.probarents.no) and PetroArctic (http://www.petroarctic.no) which help to connect supply companies with oil companies.

Meanwhile, Statoil and ENI (another energy company) have entered into cooperation with local higher education initiatives such as EnergiCampus Nord. The coastal fishing fleet has been employed in regional oil spill response systems which supplements fishing livelihoods. These initiatives are welcome, but there is no doubt that these initiatives will bring in outsiders seeking either temporary or permanent livelihoods. The population is likely to expand in the short-term, not just from the temporary workers moving in and out, but also from those drawn to new business opportunities in the region. Thus migration is expected to increase as a result of in-migration from outsiders seeking to take advantage of new economic opportunities and from the offshore workers who continually move through the area to get to and from the offshore facilities.

The potential negative effects on the Saami population and culture were considered in the impact assessment for Goliat. While the negative effects were found to be negligible, there are questions about whether all factors were fully considered. Nonetheless, ENI has promised to launch initiatives directed specifically at the Saami population to ensure that they benefit from the development (Government of Norway, 2009a). Those gains are most likely to be in the form of financial income as well as employment opportunities within the industry. Careful management of these options could provide the economic boost to maintain traditions although there is also the potential that Saami are drawn to employment opportunities in the petroleum industry and leave behind traditional hunting, fishing, and herding livelihoods.

One major difference between the development of offshore fossil fuels and onshore mining is land access. If Saami are denied their traditional lands or denied mobility, then the options for maintaining their traditional livelihoods will be severely diminished, possibly encouraging outward

migration. Laponia is an example of land protected for reindeer herding. If other protected areas (not necessarily World Heritage Sites) were set aside for reindeer herders to maintain their traditional mobility, even with expansion that would be needed due to the factors mentioned in section 3.1 below, these areas could provide a balance between giving Saami the options to maintain their inland traditional livelihoods through mobility and other uses of the land.

The increased dominance of outside cultures and interests in the Arctic is expected to influence migration decisions in different ways. The increasing presence of outsiders in the Arctic opens possibilities for those who wish to explore new opportunities in another region as well as potential for migration through marriage. No assumption should be made regarding the net influence of these factors on migration. The stereotype and first-order assumption is that Arctic people, including the Saami, go south for education, jobs, or marriage – consequently losing their roots. That happens, but many cases exist of southerners marrying Saami or other Arctic locals and then moving north – or simply choosing the Arctic land and lifestyle. Similarly, education in the south and exposure to non-Arctic cultures can strengthen one's ties to one's land and traditions, convincing Arctic peoples to return north.

A key impact of climate change is that it will draw far more outsiders and far more money into the Arctic than before, providing both opportunities and distractions for Saami seeking to maintain traditional ways in a modern setting. No migration outcome is certain, but is likely to depend on how well the changes are managed internally.

3. RESPONSES TO CLIMATE CHANGE AND MIGRATION

3.1. Indigenous Communities

This section focuses on the reactions and actions of Saami to the potential effects of climate change on livelihoods and migration. There has been a perceived need for strong, almost militant, advocacy because of the history of the three central governments in ignoring indigenous interests, pursuing assimilation programs and forced displacement, and avoiding acknowledgement of indigenous rights. As one of many examples Mustonen et al. (2010) provide a history of Finland's forcible displacement of Saami for hydroelectric development. Similar processes occurred in Norway, where the damming of the Alta-Kautokeino watercourse above the Arctic Circle galvanized large protests and brought Saami rights to the forefront of national politics (Briggs, 2006). Over the past generation, the three governments have fully accepted the principles behind indigenousness and the Saami as being a people in their own right (legal aspects are discussed in section 3.2). In practice, disputes and differences of opinion continue with respect to interpreting and exercising the rights of indigenous people in Arctic Scandinavia. With climate change making both Arctic land and Arctic waters more accessible to those from outside the Arctic, continual conflict resolution is likely to be needed.

The Saami have sought to work with other indigenous groups on promoting their rights and interests in the context of climate change. The UN Permanent Forum on Indigenous Issues has been used to this effect (Olli, 2008) as have many other fora. Two examples are the *International Experts Meeting on Climate Change and Arctic Sustainable Development* (UNESCO, 2009) held in Monaco in March 2009 and the *Indigenous Peoples' Global Summit on Climate Change* (Indigenous Peoples' Global Summit on Climate Change, 2009) held in Anchorage Alaska in April 2009.

Another program, Many Strong Voices (MSV) "brings together the peoples of the Arctic and Small Island Developing States to meet the challenges of climate change" (http://www.manystrongvoices.org; Kelman, 2010). MSV is based on the premise that climate change challenges fundamental human rights and should be addressed on that basis. Indigenous

peoples' organizations work together with researchers, civil servants, policy-makers, NGO workers, and the private sector to understand how to investigate and address the climate change challenges facing communities in the Arctic and Small Island Developing States. Traditional knowledge is combined with more recent research to inform decision-makers on how to maintain indigenous cultures in the face of the extensive environmental and social changes being experienced around the world. Based on indigenous peoples' requests, three main tasks are undertaken: capacity building to support indigenous representation and voices at international climate change negotiations; cutting-edge community-based research for acting on climate change; and communications and outreach with other indigenous peoples and with the wider world.

Indigenous views are far from homogenous. The Saami have many disagreements within and among groups, especially over managing change. For example, Korsmo (1996) details how one group of reindeer herders in Sweden broke off from the plans for the Saami Parliament there (see section 4.2) to form its own association. In particular, as noted above, the Saami are not exclusively an Arctic people, but their lands and livelihoods extend far south of the Arctic Circle. That sometimes leads to differences in views between northern and southern groups, as well as exclusion of Saami from one area of a country from membership in groups in other areas (Korsmo, 1993). Disagreements regarding managing change also occur between Saami who herd reindeer and those who do not, as well as between larger and smaller herders.

The reindeer herders have been some of the most proactive Saami in terms of developing and implementing climate change adaptation activities Ealát is "a Reindeer Herders Vulnerability Network Study and is a project that examines reindeer pastoralism in the light of climate change" (http://www.ealat.org). The website is a vast resource of material provided mainly by reindeer herders regarding knowledge and actions pertaining to climate change adaptation.[7] Ealát involves reindeer herders as Masters and PhD students, further reinforcing the need to combine different knowledge types for adaptation while keeping Saami youth in the north by combining traditional and other livelihoods.

Many other scientific research projects led by or involving Saami exist regarding climate change adaptation, but they are focused on reindeer herders. Overall, one main conclusion is that the effect of climate change only on reindeer husbandry is expected to be relatively small and well within the range of the previous experience of reindeer herders (Rees et al., 2008) in comparison with the impacts of management regimes for reindeer herding. That is, it seems to be the policies put in place to manage reindeer husbandry, and not climate change per se, that represents the greatest challenge for climate change adaptation by reindeer herders. The policy regime influences migration much more than environmental changes, since limited mobility reduces the ability to respond flexibly to the impact of climate change (e.g. Galvin, 2009; Næss, 2012). This conclusion is in line with most studies on climate change and development, that (with some exceptions such as sea-level rise inundating coastal areas), it is not climate change per se that leads to displacement, but social and governance factors which inhibit adaptation that in turn forces people to migrate (e.g. ADB, 2012; Bedford and Hugo, 2012; Foresight, 2011).

3.2. Indigenous Communities and Governments

Given that climate change itself appears not to be the fundamental influence on Saami migration, but rather the factors making it difficult for reindeer herders to adapt to climate change that will

[7] Eight work packages cover (1) climate scenarios and local climate conditions, (2) pasture conditions, (3) reindeer herders' knowledge, (4) institutions and governance for adaptation, (5) impacts of climate change on reindeer, (6) combining knowledge types for adaptation, (7) assessing vulnerability, and (8) pedagogy.

lead them to migrate, the focus of this section is on the interaction between Saami and governments for reindeer herding. That is then interpreted in wider contexts of climate change and migration.

Saami reindeer husbandry in Norway currently operates at three different levels of social organization, which are, from largest to smallest:

1. The district, which is a formal management unit with responsibility to provide information to the Norwegian reindeer husbandry administration. The district is also responsible for ensuring that reindeer husbandry is managed in accordance with government regulations (Bull, 1997). As such, the district is effectively the lowest level of governmental management of the reindeer husbandry industry (Ulvevadet, 2008).
2. The *siida*, which is a cooperative unit comprising one or more reindeer management families, usually organized on the basis of kinship joined together in social and labor communities for keeping control of herds of reindeer through herding.
3. The husbandry unit, also called a 'siida share' in Norway in the Reindeer Management Act of 2007, which is the basic unit and is licensed by the government to manage a herd of reindeer within a delimited area.

In Norway, the recent history of Saami reindeer husbandry can be summarized as being influenced by increasing governmental subsidies and regulations regarding the meat market coupled with increased sedentarisation and, as mentioned above, the use of newer technology (Riseth, 2006). After World War II, Norway's national government introduced measures to support reindeer husbandry as part of post-war regional development, leading to a doubling of the number of reindeer from around 1970-1990 and a doubling of the number of husbandry units from 1950 to 1990 (Riseth and Vatn, 2009). The following paragraphs summarize two reindeer-related laws and one agreement in Norway as indicative of government-Saami interaction over seasonal migration within the Scandinavian Arctic, illustrating how climate change does not influence indigenous migration decisions as much as governmental policies. Similar arguments could be made for Sweden and Finland.

The 1976 General Agreement for the Reindeer Industry was negotiated between the Saami Reindeer Herders' Association of Norway (NRL) and the Norwegian government. This agreement sought the protection of reindeer pasture areas from encroachment from other industries and security of both welfare and income for Saami reindeer herders (Riseth and Vatn, 2009). This would permit reindeer-related seasonal migration to continue while trying to avert migration of reindeer herders away from reindeer pasture to seek other livelihoods. The agreement laid the foundation for annual agreements pertaining to government subsidies and development that continue today (Riseth and Vatn, 2009; see also Ulvevadet, 2008). Generally in Norway, two subsidy systems exist. First, subsidies targeting herding units which are either operating subsidies aimed at increasing net income and or else production subsidies aimed at increasing production and delivery at slaughterhouses (Government of Norway, 2007b; Reindriftsforvaltningen, 2008). This system is managed by the Ministry of Agriculture and Food. Second, predation compensation (section 2.1) which is managed by The Norwegian Directorate for Nature Management under the Ministry of the Environment.

Accordingly, in many districts, half of the generated income can be from governmental support and compensation (Berg, 2008), providing some incentive to remain as herders. One consequence of this long-term governmental involvement in the Arctic has been larger herd sizes (Næss and Bårdsen, 2010; Riseth and Vatn, 2009).

In 1978, a new Reindeer Management Act was adopted, focusing on (1) establishing formal institutions for access to the reindeer husbandry and pasture management and (2) implementing co-management between the Saami and different governmental levels. The establishment of formal

institutions was based on the rationalization and efficiency paradigm, meaning structural rationalizing (questions pertaining to the relationship between the number of reindeer and pastures as well as how many herders are needed) and production rationalizing (improved use of the biological potential of the reindeer population, e.g. changes pertaining to sex ratio, age structure, and weight structure; see Riseth, 2006 for technical details). Co-management, on the other hand, was based on herder representation in the administration of the reindeer husbandry, both regionally and nationally (Riseth and Vatn, 2009). Locally, democratically elected district boards were established for each reindeer district (Ulvevadet, 2008). The overall intention was to establish a governance framework that would limit the growth of both husbandry units and herds and would ensure that that reindeer herders and their representatives would be accountable for their herd management decisions (Riseth and Vatn, 2009; Ulvevadet, 2008).

The focus on co-management has been broadened in the Reindeer Management Act of 2007 in which *siidas* are formally recognized by the Norwegian government as governance territories. The committee in charge of proposing the 2007 Reindeer Management Act wanted "more power-sharing between the government and industry and more influence on the part of reindeer owners" and that the "industry should have self-determination and influence but also more responsibilities for its actions" (Ulvevadet, 2008, p. 66). To accommodate increased co-management, the traditional *siida* system has been recognized as an important management unit and contact point between the reindeer herders and government levels (Government of Norway, 2007a; Ulvevadet, 2008). The assumption is that "a well-arranged management system at the local level will lead to better social relations, increased trust and better co-operation among the reindeer owners" (Ulvevadet, 2008, p. 68).

As such, even with climate change as a background over the past few decades, reindeer husbandry in Arctic Scandinavia has experienced far greater changes resulting from management decisions, which are not necessarily negative, but which must be acknowledged within the context of migration decisions (Beach, 2000; Berg, 2008; Bergstrøm, 2005; Bjørklund, 1999, 2004; Paine, 1994; Riseth, 2000; Riseth and Vatn, 2009):

1. Practices which decrease contact between people and animals.
2. A monetary rather than subsistence economy.
3. Sedentarization, namely settling in towns.
4. Reindeer husbandry as an occupation rather than as a way of life.
5. The use of modern technology, namely transportation and communications.
6. Increased reliance on governmental support and control, e.g. limiting the number of animals and the recruitment of reindeer herders.

These changes need to be viewed in the context of government-Saami relations beyond reindeer herding. Until later in the 20th century, the Swedish government pursued a 'phase-out' policy, in terms of supporting Saami land rights and traditional livelihoods to some degree, but making it difficult for those rights and livelihoods to be passed down to future generations (Korsmo, 1993). Many Saami who fished inland were forced from their homes along rivers when dams and reservoirs were built (Korsmo, 1993). In the late 1980's, proposals to give Saami significant control over land exploitation decisions in pasture areas were denied by the national parliament which opted instead for mandatory consultation with Saami but not mandatory implementation of Saami recommendations (Korsmo, 1993). Consequently, logging could be pursued on pasture land without Saami approval.

More recently, the UN has harsh words (legitimately or not) about Sweden: "Over the past ten years, Swedish policy has been based not on the Sámis' status as an indigenous people in Sweden but, at best, on the Sámis as a national minority. In Sweden, insufficient steps have been taken to ensure Sámi participation as required by international conventions" (OHCHR, 2010). OHCHR (2010)

continues, lambasting Sweden's 2009 bill *From Recognition to Empowerment – the Government's Strategy for the National Minorities* and *the Act on National Minorities and Minority Languages* for being ineffectual and not living up to the promises made.

The Government of Sweden (2010) disagrees, suggesting that this legislation supports Saami autonomy, language, and culture. The government states that the areas in Sweden where Saami can be accepted as an official language are being expanded while the funds given to minorities are being increased. It is not clear that these measures resolve Forrest's (1998, p. ii) fundamental critiques about the relationships of Scandinavian governments with their indigenous people:

> 1. "Nordic states viewed the Sami as nomadic, thus having no ownership of their land.
> 2. Traditional Sami activities, notably reindeer herding, were viewed as illegitimate or backwards, resulting in the privileging of modern forms of land use such as agriculture.
> 3. Where states did feel an impulse to protect the Sami way of life, they viewed nomadic pastoralism as economically non-viable, prompting systems of administration which increased state regulation of herding.
>
> These conflicts lie at the root of the issues which the Sami are struggling with today: rights to land and resources, self-government, and self-management in herding."

Sonniksen (c. 2000) notes that some of the criticisms against Sweden are more about the past than the present, but nonetheless summarizes the root problem in Sweden as being "the Swedish government's narrow interpretation of Sami ethnicity" in that "a Sami could only expect cultural protection if he was involved in reindeer herding; all other Sami were legally and culturally assimilated." The foundation for that viewpoint might go back to a 1981Swedish Supreme Court ruling that the Saami do not own the land that they use for livelihoods, but instead have just a strong right to use that land (Korsmo, 1996). Sonniksen (c. 2000) also details court cases brought by private landowners against Saami people using land for reindeer herding. Korsmo (1993) details some cases of Swedish Saami taking the government to court at the European level regarding Saami rights and losing because Swedish law did not fully support indigenous rights. The updated Swedish legislation is meant to overcome some of these concerns, but no conclusions can yet be drawn regarding the legislation's impact, since the legislation has not yet been fully tested in court.

For Finland, Josefsen (2010) discusses the provisions in the constitution and the current laws governing the Saami, highlighting in particular that "[c]ontrary to what is the case in both Sweden and Norway, the authorities are obliged to negotiate with the Saami Parliament regarding all important decisions that either directly or indirectly may affect the Saami's status as an indigenous people" (pp. 7-8). Implementation has been less successful according to Josefsen (2010) who claims that Finland's national authorities have few skills or knowledge to properly follow the legislation.

Neither Sweden nor Finland has ratified *ILO Convention 169 Indigenous and Tribal Peoples Convention, 1989*, whereas in 1990 Norway was the first country to do so. In fact, Saami rights to the land are strong in Norway, especially in the northernmost county of Finnmark. Based on the *Finnmark Act from 17. June 2005*, a legal entity called *Finnmarkeiendom* (Finnmark ownership) owns and governs the county's resources and land. Its board comprises three members selected by the Finnmark County government and three members selected by the Norwegian Saami Parliament. It has established a commission which is currently mapping existing users' and owners' rights based on long-term use. Some claim that the Finnmark Act gives the Saami special rights, although that is not the legal intention which is rather to give all inhabitants of Finnmark equal rights to the land, water, and resources, irrespective of

ethnicity. Finnmarkeiendom's work does not regulate reindeer herding, even if they own the land, because reindeer herding is regulated by another Norwegian law (discussed above) and government department.

Within all these national-Saami interactions, sit the Saami Parliaments, one for each Scandinavian country. The parliaments' powers and mechanisms differ slightly, but all exist to try to give Saami people a more prominent voice in Saami affairs. For coordination, a Saami Parliamentary Council exists with representatives of the three parliaments plus Russian Saami as observers. Additionally, the Saami Council has the aims of "the promotion of Saami rights and interests in the four countries where the Saami are living, to consolidate the feeling of affinity among the Saami people, to attain recognition for the Saami as a nation and to maintain the economic, social and cultural rights of the Saami in the legislation of the four states" (http://www.saamicouncil.net).

The Saami have made it clear they are deeply concerned about the government's approach to managing Arctic Scandinavia under climate change. In 2008, the Saami Parliamentary Council's President stated at the UN Permanent Forum on Indigenous Issues that "neither our governments nor the industrial interests seeking exploration of the non-renewable resources on our territories have recognised our right to take part in the governing of and the right to share in the economic benefits of industrial recourses found in our territories" (Olli, 2008).

The issue is not just about resource extraction with or without Saami consent, but also the perception of full and fair consultation so that not only is due process followed, but also that Saami accept that due process has been followed. Similarly, perceptions that resource income is being applied for Saami benefit, and that decisions about resource income are being done in a consultative fashion, are part of ensuring that Arctic Scandinavia gains from the resource extraction expected to increase as a result of climate change. But the Saami, and many others in Arctic Scandinavia, are clear that resource access, on land and in the sea, does not necessarily mean resource extraction. That is, other environmental uses and community values must be considered in making resource management decisions.

If not, then the migration implications are multi-faceted, not because of climate change per se but because of how climate change is being (mis)managed through resource extraction. Without access to grazing areas, and the flexibility needed as grazing areas change under climate change, little incentive exists for Saami to continue reindeer husbandry. If Saami culture is eroded in other ways, such as limited support for their culture and language or the expansion of non-indigenous populations in the Arctic for resource extraction, then living in the Arctic might be less attractive. These influences could lead to Saami migration out of the Arctic as a result of the knock-on effects of the way in which climate change is addressed and the way in which governments interact with the Saami over resource extraction.

4. RECOMMENDATIONS

4.1. Gaps and Issues Not Fully Addressed

Many gaps and issues remain for reindeer herding in terms of management and co-management. Herds are potentially becoming too large resulting in: (1) decreasing body mass which affects survival (Aslaksen and Måsø, 2010; Tveraa et al., 2003) and slaughter weights; (2) increasing conflicts (Vuolab and Måsø, 2010); and (3) increasing overgrazing (Tømmervik et al., 2011). All these factors contribute to increasing reindeer husbandry's sensitivity to climate change. Revising the subsidy system, especially in Norway, would also assist with integrating reindeer management.

For instance, as described in section 3.2, currently two different ministries manage subsidies and compensation in Norway.

Specific factors where further research would be helpful regarding subsidies and compensation in Norway and hence their impact on livelihoods and migration decisions are:

- The divergence between what the government thinks the objectives are (meat production) and the Saami reindeer herders' objectives (risk management).
- The fact that decisions relating to slaughter are not only based on monetary considerations as the subsidies presuppose.
- The need to consider the impact of subsidies not only at the level of individual actors but also on individuals' strategic behavior in relation to other people.
- The need to consider a subsidy scheme similar to the EU system (see Nora and Gemini, 2011, for a short review) in which pastoralists can receive compensation for, among other things, sustainable land management rather than an exclusive focus on production

Although much of the discussion here and in the literature focuses on reindeer herding, there are major gaps in understanding the migration-related decisions of non-reindeer herding Saami. Unlike reindeer herders where seasonal migration is a way of life, seasonal migration has not been extensively used by those pursuing other livelihoods. More work is needed to understand their perspectives on mobility – within and outside of the Arctic – particularly as reindeer-herding is followed by a minority of Saami. Because they are not tied to reindeer, are non-reindeer herding Saami more flexible regarding migration? Or because they are tied to their homes in a different way, are they less flexible regarding migration?

4.2. What Actions Are Needed by Communities, Governments and Other Bodies?

Fundamentally, displacement due to climate change is not an inevitable outcome for Arctic Scandinavia. Instead, it is feasible to continue living in the Scandinavian Arctic without major problems, as long as the social support structures and governance regimes recognize the challenge of a changing Arctic and the difficulties that the Saami face. Nonetheless, climate change, the social support structures, and the governance regimes will influence people's decisions with respect to mobility and livelihoods, i.e. migration.

As such, the recommendations here are principally about making Arctic living viable in Scandinavia irrespective of climate change, especially for the Saami. This situation tends to be different from other Arctic locations where the changes expected due to climate change can undermine the physical and social basis for viable indigenous Arctic communities. Consequently, displacement is a real concern and an ongoing reality in some locations.[8] The Saami face many threats and challenges to their livelihoods, but not principally from climate change, even though climate change may be an impetus or trigger for migration decisions.

The recommendations below are divided into categories according to the level of governance which would dominate the implementation: mainly (but not exclusively) local, non-local (mainly national), and joint local and non-local:

1. Mainly (not exclusively) local:

- Education in Arctic schools (and elsewhere around Scandinavia) could include more content on indigenous traditions. In the Arctic, this could increase the engagement of indigenous youth with their own culture and communities and especially guide their understanding of and reaction to climate change. Educational initiatives could also include short courses

[8] Examples are discussed in Robin Bronen's paper on Alaska available at www.brookings.edu/idp.

given for temporary and permanent migrants into the Arctic about Arctic and Saami life and livelihoods.
- Mechanisms for conflict resolution could be improved, especially in terms of addressing conflicts between traditional and new livelihoods, but also with respect to ongoing issues (e.g. wolves, fish farming, reindeer herding, mining, petroleum, forestry, and hydroelectricity) to ensure that they are relevant to indigenous perspectives and needs.
- Local mapping of needs and actions for local climate change adaptation could be carried out in a way that includes both indigenous and non-indigenous perspectives.

2. Mainly (not exclusively) non-local, referring mainly to the national level:
- Land use decisions require significant management and consultation processes. In particular, more attention will be needed for establishing a regime of protected areas (land, coastal, and marine), given the need for significant upgrades to specific harbor facilities due to increased shipping use, tourism, and fossil fuel exploration and extraction. Assessment and monitoring of infrastructure in light of changing environmental conditions resulting from climate change will also be needed.
- More comparative analysis is needed to understand how the Saami reindeer herders can best adapt to climate change, especially through comparisons with other pastoralists, e.g. Tibet and Mongolia (which have similarities to Arctic climate) and sub-Saharan Africa (which is a completely different environment, but where there are similarities in pastoral life). Comparative analysis is also needed to look more deeply into similarities and differences among Norway, Sweden, and Finland as well as the situation of the Russian Saami.
- Arctic infrastructure and social mechanisms (e.g. financial incentives) could be further developed according to the needs of the residents (rather than outside interests) to permit living in the Arctic under climate change while pursuing locally-based livelihoods using traditions together with modern social and technological innovations.
- Existing mechanisms could be used more effectively to address indigenous interests, such as the Arctic Council, the Nordic Council of Ministers, the European Union, and Barents Sea networks.

3. Joint local and non-local:
- Improved coordination amongst all reindeer-related authorities and management mechanisms would assist reindeer management, especially in terms of reducing herd size, revising the subsidy system, and recognizing the advantages and limits of co-management.
- Coordination and linking of observational networks around the Arctic could be improved, especially to make better use of Saami knowledge and experience on their own terms while integrating that with scientific and external observations.
- Links with and cooperation on Russia could be improved, as well as for other Arctic countries. That would particularly involve continuing to link the Saami with other indigenous peoples networks, so that they could continue to share stories and solidarity.

5. CONCLUSIONS

Change is needed in three overarching directions. These indicate future areas for research, discussion, and actions regarding Saami migration in the context of climate change in Arctic Scandinavia.

First, short-term action with long-term perspectives is needed now. Climate change is occurring, and will continue to occur faster in the Arctic than in other regions. The reindeer herding Saami see a need for action as soon as possible—not because of its migration consequences but because of its consequences on their reindeer herding livelihoods. Simultaneously, they stress the need for a long-

term perspective when planning for climate change in the context of all the other challenges that they face, such as mining, petroleum exploitation, and the alleged lure of the south. Although some of these actions could require substantial investments, they can also be seen as an opportunity. Examples of opportunities are upgrading current (often decaying) infrastructure, generating self-sustaining livelihoods, and implementing actions that irrespective of climate change will maintain Saami values and traditions within the context of modern social and technological innovations. Thus, climate change adaptation could be used to improve living conditions for Saami and to sustain Saami livelihoods in the face of all challenges, including climate change.

Second, full and fair participation of Saami in decisions affecting them should be ensured. Policies, laws, and regulations are needed for dealing with Saami and migration-related topics, covering everything from reindeer mobility to people choosing to settle in or out of the Arctic. Any measures taken should be developed, implemented, monitored, and enforced with full and fair participation of the Saami, including recognizing differences of opinion among different Saami groups. Measures relevant in all three countries—and preferably also including Russia—might be particularly effective at helping the Saami deal with the multitude of challenges that they face including climate change. Strengthening the powers of the Saami parliaments might assist in such actions, but that would increase the costs, since few members of the parliaments are full-time. Additionally, care is needed to include non-Saami in decisions and to effect changes needed at the national level to ensure that Saami interests are heard in national parliaments.

Third, changing demographics of Arctic Scandinavia need to be recognized and addressed, especially with regards to temporary migrants. As a principle, the Saami do not fundamentally oppose others moving into the Arctic, permanently or temporarily. Nor are the Saami fundamentally opposed to the principle of resource exploitation, whether petroleum, mining, forestry, fish, hydroelectricity, or others. They are opposed to decisions being made without Saami input and to outsiders taking over Arctic locations and resources without respecting those already living in the Arctic. Beyond full and fair participation and decision-making power other needed measures include: better links between the Saami and resource exploitation projects, ensuring that non-Saami understand Saami perspectives and vice versa, and using resource wealth to support Saami culture, language, and livelihoods.

By supporting change in these three overarching directions, the impact of climate change on indigenous people in Arctic Scandinavia can be lessened and its impact on migration minimized. Climate change is already occurring and is unlikely to be reversed. The Arctic and the peoples living there will need to deal with its effects. That does not mean abandoning their traditions, livelihoods, or homes. Instead, it means working collaboratively to ensure that indigenous interests are respected and that indigenous needs are met without precluding the involvement of others in the Arctic and without being overwhelmed by climate change.

REFERENCES

ACIA. 2005. *Arctic Climate Impacts Assessment*. Cambridge University Press, Cambridge, U.K.

ADB. 2012. *Addressing Climate Change and Migration in Asia and the Pacific: Final Report*. ADB (Asian Development Bank), Mandaluyong City, Philippines.

AHDR. 2004. *Arctic Human Development Report*. Stefansson Arctic Institute, Akureyri, Iceland.

AMAP. 2011. *Snow, Water, Ice and Permafrost in the Arctic*. AMAP (Arctic Monitoring and Assessment Programme) Secretariat, Oslo, Norway.

Anonymous. 2001. *Rundskriv juni 2001 Viltloven: Erstatning for tap av tamrein*. Direktoratet for naturforvaltning, Oslo, Norway.

Aslaksen, E. and N.H. Måsø. 2010. Venter på døden. In NRK Sápmi – NRK, Kárášjohka/ Karasjok, Norway. http://nrk.no/kanal/nrk_sapmi/1.7405119

Beach, H. 2000. Pastoralism Politics in Sweden: Protecting the Environment and Designing the Herder. In A. Hornborg and G. Pálsson (eds.), *Negotiating Nature: Culture, Power, and Environmental Argument*, Lund University Press, Lund, Sweden, pp. 179-211.

Bedford, R. and G. Hugo. 2012. *Population Movement in the Pacific: A Perspective on Future Prospects*. Department of Labour, Wellington, New Zealand.

Berg, B.Å. 2008. Utviklingen av reindriften i nordre Nordland 1750-2000. In B. Evjen and L.I. Hansen (eds.), *Nordlands kulturelle mangfold: etniske relasjoner i historisk perspektiv*, Pax, Oslo, Norway, pp. 151-191.

Bergstrøm, C. 2005. *Claiming reindeer in Norway: towards a theory of the dynamics of property regime formation and change*. PhD dissertation, Norwegian University of Life Sciences, Ås, Norway.

Bisi, J. and S. Kurki. 2008. *The wolf debate in Finland*. Ruralia Institute, University of Helsinki, Helsinki, Finland.

Bjørklund, I. 1999. *Norsk ressursforvaltning og samiske rettighetsforhold: om statlig styring, allmenningens tragedie og lokale sedvaner i Sápmi*. Ad notam Gyldendal, Oslo, Norway.

Bjørklund, I. 2004. Saami Pastoral Society in Northern Norway: The National Integration of an Indigenous Management System. In D. G. Anderson and M. Nuttall (eds.), *Cultivating Arctic Landscapes: Knowing and Managing Animals in the Circumpolar North*, Berghahn, New York, pp. 124-135.

Briggs, C.M. 2006. Science, local knowledge and exclusionary practices: Lessons from the Alta Dam case, *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 60(2): 149-160.

Bull, K.S. 1997. *Studier i reindriftsrett, Tano Aschehoug*, Oslo, Norway.

Bulte, E.H. and D. Rondeau. 2005. Why compensating wildlife damages may be bad for conservation. *Journal of Wildlife Management*, 69(1): 14-19.

Carina, E. and H. Keskitalo. 2009. Climate Change, Vulnerability and Adaptive Capacity in a Multi-use Forest Municipality in Northern Sweden. In G.K. Hovelsrud and B. Smit (eds.), *Community Adaptation and Vulnerability in Arctic Regions*, Springer, Germany, pp. 285-311.

Debernard, J.B. and L.P. Røed. 2008. Future wind, wave and storm surge climate in the Northern Seas: a revisit. *Tellus A*, 60: 427-438.

Debernard, J., Ø Sætra, and L.P. Røed. 2002. Future wind, wave and storm surge climate in the northern North Atlantic. *Climate Research*, 23: 39-49.

Drange, H., B. Marzeion, A. Nesje, and A. Sorteberg. 2007. Opptil én meter havstigning langs Norskekysten innen år 2100. *Cicerone*, 2: 29-31.

Ealát. 2012. http://www.ealat.org

Engen-Skaugen T., Benestad R. & Førland E.J. 2008. *Results from ESD analyses on precipitation representing twenty-five Norwegian catchments*. Report 23, Norwegian Meteorological Institute, Oslo, Norway.

Flannigan, M.D., Y. Bergeron, O. Engelmark, and B. M. Wotton. 1998. Future Wildfire in Circumboreal Forests in Relation to Global Warming. *Journal of Vegetation Science*, 9(4): 469-476.

Førland, E.J. (ed.), R.E. Benestad, F. Flatøy, I. Hanssen-Bauer, J.E. Haugen, K. Isaksen, A. Sorteberg, and B. Ådlandsvik. 2009. *Climate development in North Norway and the Svalbard region during 1900-2100*. Report Series 128, Norwegian Polar Institute, Tromsø, Norway.

Foresight. 2011. *Migration and Global Environmental Change*. Report for The Government Office for Science, London, U.K.

Forrest, S.M. 1998. *Do Fences Make Good Neighbours? The Influence of Territoriality in State-Sámi Relations*. Master of Arts thesis, University of Northern British Columbia, Prince George, British Columbia, Canada.

Galvin, K.A. 2009. Transitions: Pastoralists Living with Change. *Annual Review of Anthropology*, 38(1): 185-198.

Gearheard, S., M. Pocernich, R. Stewart, J. Sanguya, and H.P. Huntington. 2009. Linking Inuit knowledge and meteorological station observations to understand changing wind patterns at Clyde River, Nunavut, *Climatic Change*, 100(2): 267-294.

Government of Norway. 2001. FOR 2001-05-04 nr 468: Forskrift om erstatning for tap og følgekostnader når tamrein blir drept eller skadet av rovvilt. In *Hefte 6: Miljøverndepartementet, Avdeling for naturforvaltning*, Oslo, Norway.

Government of Norway. 2007a. *Lov om reindrift av 15. juni*. 2007 nr 40, vol. 40. Oslo, Norway.

Government of Norway. 2007b. *St.prp. nr. 74: Om reindriftsavtalen 2007/2008, om dekning av kostnader vedrørende radioaktivitet i reinkjøtt, og om endringer i statsbudsjettet for 2007 m.m.* , pp. 36: Det Kongelige Landbruks- og Matdepartement.

Government of Norway. 2009a. *Sak R12/09 Utbygging av Goliat - høring av konsekvensutredning*. Government of Norway, Oslo, Norway.

Government of Norway. 2009b. *St.meld. nr. 25: Lokal vekstkraft og framtidstru. Om distrikts- og regionalpolitikken*. Government of Norway, Oslo, Norway.

Governments of Norway and Sweden. 2009a. *Områdeprotokoll til konvensjon mellom Norge og Sverige om grenseoverskridende reindrift*. http://www.regjeringen.no/upload/LMD/Vedlegg/Regelverk/Reindrift_Omraadeprotokoll_til_konvensjon_mellom_Norge_Sverige_260209.pdf

Governments of Norway and Sweden. 2009b. *Konvensjon mellom Norge og Sverige om grenseover skridende reindrift*. http://www.regjeringen.no/upload/LMD/Vedlegg/Regelverk/Reindrift_konvensjon_Norge_Sverige_260209.pdf

Government of Sweden. 2010. *Minority Rights are Strengthened*. Ministry For Integration And Gender Equality, Government of Sweden, Stockholm, Sweden.

Hanssen-Bauer, I. (ed.) 2009. *Klima i Norge 2100*. Bakgrunnsmateriale til NOU Klimatilpasning. Norsk klimasenter – Departementenes servicesenter, Oslo, Norway.

Hanssen-Bauer, I., C. Achberger, R.E. Benestad, D. Chen, and E.J. Førland. 2005. Statistical downscaling of climate scenarios over Scandinavia. *Climate Research*, 29(3): 255-268.

Haugen, A. and J. Mattsson. 2011. Preparations for climate change's influences on cultural heritage. *International Journal of Climate Change Strategies and Management*, 3(4): 386-401.

Hyvönen, H. (Director). 2007. *The Last Yoik in Saami Forests? [Documentary]*.Finland.

Indigenous Peoples' Global Summit on Climate Change. 2009. *Report of the Indigenous Peoples' Global Summit on Climate Change*, 20-24 April 2009, Anchorage, Alaska.

IPCC. 2007. *IPCC Fourth Assessment Report*. IPCC (Intergovernmental Panel on Climate Change), Geneva, Switzerland.

Josefsen, E. 2010. *The Saami and the national parliaments: Channels for political influence*. Inter-Parliamentary Union and United Nations Development Programme, Geneva, Switzerland.

Kelman, I. 2010. Hearing local voices from Small Island Developing States for climate change. *Local Environment*, 15(7): 605-619.

Korhonen, J. 2008. *Sunny day in Lemmenjoki gold fields* [Video]. http://www.youtube.com/watch?v=NahOTuJA090

Korsmo, F. 1993. Swedish Policy and Saami Rights. *The Northern Review*, 11: 32-55.

Korsmo, F. 1996. Claiming Territory: The Saami Assemblies as Ethno-Political Institutions. *Polar Geography*, 20(3): 163-179.

Kullman, L. 2001. 20th Century Climate Warming and Tree-limit Rise in the Southern Scandes of Sweden. *Ambio*, 30(2): 72-80.

Little, P.D., H. Mahmoud, and D.L. Coppock. 2001. When deserts flood: risk management and climatic processes among East African pastoralists. *Climate Research*, 19(2): 149-159.

Many Strong Voices. 2012. http://www.manystrongvoices.org

Mustonen, M. and T. Mustonen in cooperation with Antti Aikio and Pekka Aikio. 2010. *Drowning Reindeer, Drowning Homes: Indigenous Sámi And Hydroelectricity Development In Sompio, Finland*. Snowchange, Vaasa, Finland.

National Snow and Ice Data Center. 2013. *Arctic Climatology and Meteorology. http://nside.org/arcticmet/glossary/cryosphere.html*

Næss, M.W. 2012. Tibetan Nomads Facing an Uncertain Future: Impacts of Climate Change on the Qinghai-Tibetan Plateau. In A. Lamadrid and I. Kelman (eds.), *Climate Change Modeling for Local Adaptation in the Hindu Kush-Himalayan Region*. Emerald Group Publishing Limited, Bingley, U.K., pp. 99-122.

Næss, M.W. and B.-J. Bårdsen. 2010. Environmental Stochasticity and Long-Term Livestock Viability-Herd-Accumulation as a Risk Reducing Strategy. *Human Ecology*, 38(1): 3-17.

Næss, M.W., B.-J. Bårdsen, E. Pedersen, and T. Tveraa. 2011. Pastoral herding strategies and governmental management objectives: predation compensation as a risk buffering strategy in the Saami reindeer husbandry. *Human Ecology*, 39(4): 489-508.

Nilsen, R. and J.H. Mosli. 1994. *Inn fra vidda: hushold og økonomisk tilpasning i reindrifta i Guovdageaidnu 1960-1993*. NORUT samfunnsforskning rapport / Bajos, Guovdageaidnu, Norway.

Nora, S. and M. Gemini. 2011. The Common Agricultural Policy vis-à-vis European pastoralists: principles and practices. *Pastoralism: Research, Policy and Practice*, 1: 27.

OHCHR. 2010. The Sámi indigenous people in Sweden and the Right to Participate in Decision-Making. OHCRH (The Office of the High Commissioner for Human Rights), Geneva, Switzerland.

Olli, E. 2008. *Indigenous Issues and Climate Change*. Statement to the UN Permanent Forum on Indigenous Issues, 22 April 2008, http://www.norway-un.org/NorwayandUN/Selected_Topics/Climate_Change/042408_IndigenousIssuesClimateChange

Paine, R. 1994. *Herds of the Tundra: a portrait of Saami reindeer pastoralism. Smithsonian series in ethnographic inquiry*, Smithsonian Institution Press, Washington, D.C. and London, U.K.

Rees, W.G., F.M. Stammler, F.S. Danks, and P. Vitebsky. 2008. Vulnerability of European reindeer husbandry to global change. *Climatic Change*, 87(1-2): 199-217.

Reindriftsforvaltningen. 2008. *Ressursregnskap for reindriftsnæringen*. Alta, Norway.

Riseth, J.Å. 2000. *Sámi reindeer management under technological change 1960-1990: implications for common-pool resource use under various natural and institutional conditions: a*

comparative analysis of regional development paths in West Finnmark, North Trøndelag, and South Trøndelag/Hedmark, Norway. Doctor scientarium, Norges landbrukshøgskole.

Riseth, J.Å. 2006. Sámi reindeer herd managers: why do they stay in a low-profit business? *British Food Journal*, 108: 541-559.

Riseth, J.Å. and A. Vatn. 2009. Modernization and Pasture Degradation: A Comparative Study of Two Sàmi Reindeer Pasture Regions in Norway. *Land Economics*, 85(1): 87-106.

Schwerdtner, K., and B. Gruber. 2007. A conceptual framework for damage compensation schemes. *Biological Conservation*, 134(3): 354-360.

Solberg, E.J., P. Jordhoy, O. Strand, R. Aanes, A. Loison, B.E. Saether, and J.D.C. Linnell. 2001. Effects of density-dependence and climate on the dynamics of a Svalbard reindeer population. *Ecography*, 24(4): 441-451.

Sonniksen, D. c. 2000. *Reindeer Herding in Sweden*. University of Texas, Austin, Texas, http://www.utexas.edu/courses/sami/diehtu/siida/herding/herding-sw.htm

Sorvari, S., A. Korhola, and R. Thompson. 2002. Lake diatom response to recent Arctic warming in Finnish Lapland. *Global Change Biology*, 8(2): 171-181.

Statistics Norway. 2012. *Sami in Norway*. http://www.ssb.no/english/subjects/02/01/10/samisk_en/

Stenevika, E.K. and S. Sundby. 2007. Impacts of climate change on commercial fish stocks in Norwegian waters. *Marine Policy*, 31(1): 19-31.

Svalbard Treaty. 1920. *Treaty between Norway, The United States of America, Denmark, France, Italy, Japan, the Netherlands, Great Britain and Ireland and the British overseas Dominions and Sweden Concerning Spitsbergen Signed in Paris 9th February 1920*.

Tebaldi, C., K. Hayhoe, J.M. Arblaster, and G.A. Meehl. 2006. Going to the extremes. *Climatic Change*, 79(3-4): 185-211.

Tømmervik, H., and J.Å. Riseth. 2011. *Historiske tamreintall i Norge fra 1800-tallet fram til i dag*. NINA Rapport 672. NINA (Norwegian Institute for Nature Research),Tromsø, Norway.

Tømmervik, H., B. Johansen, S.R. Karlsen, and P.G. Ihlen. 2011. *Overvåking av vinterbeiter i Vest-Finnmark og Karasjok 1998-2005-2010 - Resultater fra feltrutene*. NINA Rapport 745. NINA (Norwegian Institute for Nature Research), Trondheim, Norway.

Tveraa, T., P. Fauchald, C. Henaug, and N.G. Yoccoz. 2003. An examination of a compensatory relationship between food limitation and predation in semi-domestic reindeer. *Oecologia*, 137(3): 370-376.

Ulvevadet, B. 2008. Management of reindeer husbandry in Norway - power-sharing and participation. *Rangifer*, 28(1): 53-78.

UN. 1992. *United Nations Framework Convention on Climate Change*. FCCC/INFORMAL/84 GE.05-62220 (E) 200705, UN (United Nations), Bonn, Germany.

UN. 1998. *Guiding Principles on Internal Displacement.* E/CN.4/1998/53/Add.2, UN (United Nations), New York, U.S.A. http://www.brookings.edu/about/projects/idp/gp-page

UN. 2004. *Background paper prepared by the Secretariat of the Permanent Forum on Indigenous Issues. The Concept of Indigenous Peoples*. PFII/2004/WS.1/3, Department Of Economic And Social Affairs, Division for Social Policy and Development, Secretariat of the Permanent Forum on Indigenous Issues, United Nations, New York, U.S.A.

UNESCO (ed.). 2009. *Climate Change and Arctic Sustainable Development*. UNESCO, Paris.

Vuolab, S.E. and N.H. Måsø. 2010. Det høye reintallet skaper konflikter. From NRK Sápmi – NRK, Kárášjohka/ Karasjok, Norway. http://www.nrk.no/kanal/nrk_sapmi/1.7374581

Zahn, M. and H. von Storch. 2010. Decreased frequency of North Atlantic polar lows associated with future climate warming. *Nature*, 467: 309-312.